

## Interactions of Terrestrial and Aquatic Processes Among Lakes of the Northern Highland Lake District, USA

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In the Northern Highland Lake District of Wisconsin and Michigan, USA, thousands of connected terrestrial and aquatic systems interact in a complex, dynamic landscape. To understand the flow and storage of carbon and water across this region, we developed a new simulation model linking groundwater, terrestrial processes, and lake processes in a spatially explicit framework. This model integrates ecological processing (on land and in lakes) with physical hydrology (of the land, lakes, and groundwater pools) to estimate, for each watershed, seasonal water cycle and biogeochemical dynamics. Results indicate that fluxes between lakes and watersheds are an important component of hydrologic and carbon budgets, and the model permits the quantification of these influences across a spatial network of connected watersheds. Our understanding of these systems has been greatly enhanced by multi-decade studies in a small subset of the lake district; we show how the results of modeling these processes can be informed by both hydrologic and biogeochemical data collected at varied times and locations. This explicit incorporation of terrestrial and aquatic processes in surface and subsurface connection networks will aid our understanding of the relative roles of on-land, in-lake, and between-lake processes in this lake-rich region.